

2002, being a Saturday), please reconsider the above-identified application according to the following remarks.

REMARKS

The present amendment is in response to the Office Action mailed June 5, 2002, in which Claims 1 through 20 were rejected. Applicant has thoroughly reviewed the outstanding Office Action including the Examiner's remarks and the reference cited therein. The following remarks are believed to be fully responsive to the Office Action and are believed to render all claims at issue patentably distinguishable over the cited references.

No claims are amended herein. No claims are cancelled. No claims are added. Accordingly, Claims 1 through 20 remain pending.

Applicant respectfully requests reconsideration in light of the following remarks.

CLAIM REJECTIONS – 35 U.S.C. SECTION 103(a)

1. Claims 1 and 5

With respect to Paragraphs 1 and 2 of the first Office Action, the Examiner rejected Claims 1 and 5 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,933,733 to Feria et al. (hereinafter referred to as "Feria et al.") in view of U.S. Patent No. 5,972,783 to Arai et al. (hereinafter referred to as "Arai et al."). Of the rejected claims, Claim 1 is

independent.

Applicant respectfully traverses this rejection.

Initially Applicant observes that the proposed combination of Feria et al. and Arai et al. is improper and cannot serve as a basis for a finding of obviousness. To justify a combination of references, the Examiner must present evidence of some teaching, suggestion or incentive supporting the combination. References may be had to Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990), rehearing denied, en banc, 1990 U.S. App. Lexis 15192 (Nov. 27, 1990), cert. den., 498 U.S. 920, 112 L.Ed.2d 250 (1990). In absence of the teaching, suggestion or incentive supporting the combination, the references cannot be combined as proposed Id. Applicant respectfully submits that there is no such teaching, suggestion or incentive for such a combination in any of Feria et al. or Arai et al.

As claimed in Claim 1, the present invention provides a method for forming an indium pocket region, which comprises providing a P type semiconductor substrate and forming a dielectric layer on the P type semiconductor substrate. A photoresist layer is then formed on the dielectric layer to serve as an ion implant mask for an N type ion implantation to form N type dopant regions in the P type semiconductor substrate. An indium pocket region is then formed adjacent to each of the N type dopant regions by still using the photoresist layer as the ion implant mask.

As described in page 6, lines 2-15 of the present specification, the claimed method recites an ion implantation process with indium ions to form the pocket dopant region, which can reduce lateral distribution of pocket

dopant with boron ions encountered in the conventional method, due to indium ions are difficult to diffuse. And, for scaled nitride read only memory devices and multi-bits per cell operation, pocket dopant of indium ions can reduce pocket distribution and then, reduce electron distribution in silicon nitride along the channel during hot electron programming, which is the drawbacks of the conventional method with boron ions as the pocket dopant.

As to the cited reference, Fera et al.; see col. 4, lines 45-46, col. 5, lines 1-4, col. 8-10, lines 29-31 and FIG. 2 to FIG. 7, Fera teaches that an insulated gate layer 8 including gate oxide 9 and polysilicon gate electrode 10 is formed on an N⁻ layer 3, a P⁺ diffusion region 5 is formed beside the insulated gate layer 8 in the N⁻ layer 3. By using the insulated gate layer 8 as an ion implantation mask, an ion implantation is performed by a tilted implant angle to form a P⁻ diffusion region 6 (i.e. a pocket region) underlying the gate oxide 9 close to the sidewall of the insulated gate layer 8 (see FIG. 5 and FIG. 6). Then, a N⁺ diffusion region 7 is formed in the P⁺ diffusion region 5 adjacent to the P⁻ diffusion region 6 to serve as a source/drain region (see FIG. 7).

As indicated by the Examiner, Fera et al. does not disclose or suggest the use of indium for the pocket implantation step, as claimed in claim 1 of the present invention.

With regarding to the cited reference, Arai et al, see col. 20, lines 14-17, lines 53-67, and col. 21, lines 1-15 and FIG. 10 (a) to FIG. (b), Arai et al. teaches that a gate oxide 32 and a gate electrode 33 are formed in an N well 31. Using the gate electrode 33 as an ion implantation mask to form a P type

extension region 34 in the N well 31 and under the gate electrode 33. Still with the gate electrode 33 as the ion implantation mask, an N type pocket dopant region 35 is formed under the P type extension region 34 to improve punchthrough breakdown voltage. A spacer 36 is formed along the sidewall of the gate electrode 33. A boron ion implantation is performed to form a P type source/drain region 37 in the N well 31 beside the spacer 36, and adjacent to the P type extension region 34 and the N type pocket dopant region 35. Arai et al. also teaches that phosphorous, arsenic, indium and antimony may be used in addition to boron for serving as impurities for carrier generation (see col.20, lines 14-16).

Although Arai et al. teaches that as impurities for carrier generation which are introduced into semiconductor substrates, phosphorous, arsenic, indium and antimony may be used in addition to boron, Arai et al. does not teach or suggest that indium is superior to the other impurities such as, boron, phosphorous, arsenic and antimony. In accordance with the teaching of Arai et al., it seems that each of boron, phosphorous, arsenic, indium and antimony provides equivalent effect to serve as impurities for carrier generation. Therefore, there is no any teaching or incentive in Arai et al. to use indium ions as the pocket dopant instead of boron ions, like the claimed invention, in order to overcome the drawbacks of the conventional method with boron ions as the pocket dopant, such as easily diffusion of the pocket dopant to increase pocket distribution and electron distribution in a silicon nitride layer along the channel during hot electron programming to reduce the cell's ability to punchthrough to the drain when reading a bit near a source. That is to say, the

teaching of Arai et al. does not provide a un-expect result like the claimed invention to use indium ions as the pocket dopant instead of boron ions.

Accordingly, neither Feria et al. nor Arai et al. disclose or teach/suggest using indium ions as the pocket dopant instead of boron ions to overcome the drawbacks of the conventional method, whether individually or in combination. Thus, Claim 1 and Claim 5 depending thereupon including all of the limitations of Claim 1 are patentably distinguished over the cited references, Feria et al. and Arai et al.

Applicant respectfully requests that the Examiner's 35 U.S.C. Section 103(a) rejection of Claims 1 and 5 be reconsidered and withdrawn.

2. Claims 2, 3 and 4

With respect to Paragraphs 1 and 3 of the first Office Action, the Examiner rejected Claims 2 through 4 under 35 U.S.C. Section 103(a) as being unpatentable over Feria et al. in view of Arai et al. and in further view of US Patent No. 4,937,756 to Hsu et al. (hereinafter referred to as "Hsu et al.")

Applicant respectfully traverses this rejection.

The cited reference, Hsu et al., see col. 3, lines 37-41, teach that an oxide/nitride/oxide (ONO) layer is used as a gate insulating layer.

Claims 2 through 4 depend upon independent Claim 1, having all of the limitations of Claim 1. Therefore, Claims 2 through 4 are patentably distinguishable over these three cited references.

Applicant respectfully requests that the Examiner's 35 U.S.C. Section 103(a) rejection of Claims 2 through 4 be reconsidered and withdrawn.

3. Claims 6, 9, 10, 11, 14 and 15

With respect to Paragraphs 1 and 4 of the first Office Action, the Examiner rejected Claims 6, 9, 10, 11, 14 and 15 under 35 U.S.C. Section 103(a) as being unpatentable over FERIA et al. in view of Arai et al. and in further view of US Patent No. 6,030,871 to Eitan (hereinafter referred to as "Eitan"). Claims 6 and 11 are independent claims.

Applicant respectfully traverses this rejection.

The cited reference, Eitan, see FIG. 4C and FIG. 4E, teaches that using a photoresist layer 40 as an ion implantation mask to form pocket dopant regions 24D and 26D. Thus, Claims 6 and 11 are patentably distinguished over the three cited references primarily based on the same reason mentioned above in response to the rejection of Claims 1 and 5 under 35 USC 103(a). Claims 9, 10, 14 and 15 depend upon Claim 6 and 11, respectively, having all of the limitations of Claim 6 and 11, respectively. Thus, Claims 9, 10, 14 and 15 are also patentably distinguished over the three cited references.

Applicant respectfully requests that the Examiner's 35 U.S.C. 103(a) rejection of Claims 6, 9, 10, 11, 14 and 15 be reconsidered and withdrawn.

4. Claims 7, 8, 12, 13 and 16 through 20

With respect to Paragraphs 1 and 5 of the first Office Action, the Examiner rejected Claims 7, 8, 12, 13 and 16 through 20 under 35 U.S.C. Section 103(a) as being unpatentable over FERIA et al. in view of Arai et al. and

Eitan and in further view of U.S. Patent No. 4,937,756 to Hsu et al. (hereinafter referred to as "Hsu et al."). Claim 16 is an independent claim.

Applicant respectfully traverses this rejection.

Primarily based upon the same reason mentioned above in response to the rejection of Claims 1 and 5 under 35 USC Section 103(a), Claim 16 is patentably distinguished over the four cited references. Its dependent Claims 17 through 20 having all of the limitations thereof also are patentably distinguished over the four cited references.

Claims 7 and 8 depend upon Claim 6, Claims 12 and 13 depend upon Claim 11, having all of the limitations of Claims 6 and 11, respectively. Thus, Claims 7, 8, 12 and 13 are patentably distinguishable over the four cited references.

Applicant respectfully requests that the Examiner's 35 U.S.C. Section 103(a) rejection of Claims 7, 8, 12, 13 and 16 through 20 be reconsidered and withdrawn.

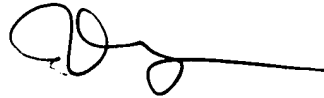
CONCLUSION

In light of the above amendments and remarks, Applicant respectfully submits that all pending Claims 1 through 20 as currently presented are in condition for allowance. If, for any reason, the Examiner disagrees, please call the undersigned attorney at 202-624-3947 in an effort to resolve any matter still outstanding *before* issuing another action. The undersigned attorney is confident that any issue which might remain can readily be worked out by

telephone.

Favorable reconsideration is respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'T. Moga', with a long horizontal line extending to the right.

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